

WHAT IS CLAIMED IS:

Sub. 41

1 A real-time maintenance alert system for use in a heavy duty
2 truck having an engine including an air filter at an air inlet, and an engine controller
3 with memory, the system comprising:
4 a sensor operative to produce a signal indicative of an air inlet
5 depression; and
6 control logic at the engine controller, the control logic being
7 configured to process the sensor signal and to determine an air filter restriction real-
8 time fault condition when the air inlet depression falls below a threshold, the control
9 logic being operative to produce an output signal in response to the air filter
10 restriction real-time fault condition.

1 2. The system of claim 1 wherein the threshold is a function of
2 an engine rpm.

1 3. The system of claim 2 wherein the threshold is a first value
2 when the engine rpm is less than a predetermined value and, otherwise, the threshold
3 is a second value.

1 4. The system of claim 1 wherein the air filter restriction real-
2 time fault condition is determined in response to the air inlet depression falling below
3 the threshold more than one time during a predetermined time interval.

Sub. a2

1 A real-time maintenance alert system for use in a heavy duty
2 truck having an engine including a fuel filter at a fuel inlet, and an engine controller
3 with memory, the system comprising:
4 a sensor operative to produce a signal indicative of a fuel inlet
5 depression; and
6 control logic at the engine controller, the control logic being
7 configured to process the sensor signal and to determine a fuel filter restriction real-
8 time fault condition when the fuel inlet depression falls below a threshold, the

9 control logic being operative to produce an output signal in response to the fuel filter
10 restriction real-time fault condition.

1 6. A real-time maintenance alert system for use in a heavy duty
2 truck having an engine including an oil filter having an inlet and an outlet, and an
3 engine controller with memory, the system comprising:
4 a sensor operative to produce a signal indicative of an oil filter
5 pressure differential between the oil filter inlet and the oil filter outlet; and
6 control logic at the engine controller, the control logic being
7 configured to process the sensor signal and to determine an oil filter restriction real-
8 time fault condition when the oil filter pressure differential exceeds a threshold, the
9 control logic being operative to produce an output signal in response to the oil filter
10 restriction real-time fault condition.

1 7. A real-time maintenance alert system for use in a heavy duty
2 truck having an engine including an oil pan, and an engine controller with memory,
3 the system comprising:
4 a sensor operative to produce a signal indicative of an oil level; and
5 control logic at the engine controller, the control logic being
6 configured to process the sensor signal and to determine a low oil real-time fault
7 condition when the oil level falls below a threshold, the control logic being operative
8 to produce an output signal in response to the oil level real-time fault condition.

1 8. The system of claim 7 wherein the low oil real-time fault
2 condition is determined in response to the oil level falling below the threshold while
3 the engine is not running.

1 9. The system of claim 8 wherein the low oil real-time fault
2 condition is determined in response to the oil level being below the threshold while
3 the engine is not running and has not been running for a predetermined time interval.

Sub. 43

10. A real-time maintenance alert system for use in a heavy duty truck having an engine including a coolant reserve tank, and an engine controller with memory, the system comprising:
a sensor operative to produce a signal indicative of a coolant level;
and
control logic at the engine controller, the control logic being configured to process the sensor signal and to determine a low coolant real-time fault condition when the coolant level falls below a threshold, the control logic being operative to produce an output signal in response to the low coolant real-time fault condition, wherein the threshold is sufficiently high such that engine shutdown is not required upon the presence of the low coolant real-time fault condition.

11. The system of claim 10 further comprising:
a primary coolant level sensor operative to produce a signal indicative of a sufficiently low coolant level to demand engine shutdown, wherein the control logic is further configured to determine an engine shutdown fault upon the presence of the primary coolant level sensor signal.

Sub. 44

12. A real-time maintenance alert system for use in a heavy duty truck having an engine, and an engine controller with memory, the system comprising:
a sensor operative to produce a signal indicative of at least one engine condition from the group consisting of: an oil filter restriction condition, a fuel filter restriction condition, an air filter restriction condition, an oil level, and a coolant level in a coolant reserve tank;
control logic at the engine controller, the control logic being configured to process the sensor signal and to determine a real-time fault condition when the engine condition falls outside of a predetermined acceptable range, the control logic being operative to produce an output signal in response to the real-time fault condition; and
a display device receiving the control logic output signal, the display device having an indicator operative to alert a user of the real-time fault condition.

1 13. A real-time maintenance alert method for use in a heavy duty ✓
2 truck having an engine, and an engine controller with memory, the method
3 comprising:
4 generating a signal with an engine sensor, the signal being indicative
5 of at least one engine condition from the group consisting of: an oil filter restriction
6 condition, a fuel filter restriction condition, an air filter restriction condition, an oil
7 level, and a coolant level in a coolant reserve tank; and
8 processing the signal with control logic at the engine controller to
9 determine a real-time fault condition when the engine condition falls outside of a
10 predetermined acceptable range, the control logic being operative to produce an
11 output signal in response to the real-time fault condition.

1 14. The method of claim 13 further comprising:
2 generating an alert signal on a display device to alert a user of the
3 real-time fault condition.

1 15. A display device for use with a real-time maintenance alert ✓
2 system for a heavy duty truck having an engine and an engine controller with
3 memory, the display device comprising:
4 a housing;
5 an interface configured to communicate with control logic at the
6 engine controller, the control logic being configured to process a sensor signal
7 indicative of an engine condition from the group consisting of: an oil filter restriction
8 condition, a fuel filter restriction condition, an air filter restriction condition, an oil
9 level, and a coolant level in a coolant reserve tank, and the control logic being
10 further configured to determine a real-time fault condition when the engine condition
11 falls outside of a predetermined acceptable range, the control logic being operative
12 to produce an output signal in response to the real-time fault condition, the interface
13 receiving the output signal; and
14 an indicator device affixed to the housing and in communication with
15 the interface, the indicator device producing a visual indication when the output
16 signal corresponding to the real-time fault condition is received at the interface.

1 16. The display device of claim 15 wherein the control logic is
2 further configured with engine protection shutdown logic operative to provide an
3 engine protection fault condition signal to the interface, the display device further
4 comprising:

5 an engine protection indicator device affixed to the housing and in
6 communication with the interface, the engine protection indicator device producing
7 a visual indication when the output signal corresponding to the engine protection
8 fault condition is received at the interface.

1 17. The display device of claim 15 wherein the control logic is
2 further configured with periodic maintenance logic operative to provide a periodic
3 maintenance fault condition signal to the interface, the display device further
4 comprising:

5 a periodic maintenance indicator device affixed to the housing and in
6 communication with the interface, the periodic maintenance indicator device
7 producing a visual indication when the output signal corresponding to the periodic
8 maintenance fault condition is received at the interface.

1 18. The display device of claim 15 further comprising:
2 a reset switch in communication with the interface, wherein the
3 interface and the control logic are configured such that assertion of the reset switch
4 causes a refreshing of the sensor signal.

1 19. The display device of claim 15 further comprising:
2 a test switch in communication with the indicator device, wherein the
3 indicator device is configured to produce the visual indication for a predetermined
4 period of time in response to assertion of the test switch.

346¹₂ 25

20. The display device wherein the indicator device comprises:
a light emitting diode.

25